WISDOM IS COMMON SENSE TO AN UNCOMMON DEGREE.

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March, 1948

the Lineman

RURAL ELECTRIFICATION ADMINISTRATION - U.S. DEPARTMENT OF AGRICULTURE

North Carolina Group Plans Meter School

The College Extension Division of North Carolina State College will hold an electric meter school April 6, 7, 8, and 9 in Raleigh, N. C. The school will be under the direction of Edward W. Ruggles, Director of the College Extension Division.

The program is divided into two separate groups -- elementary and advanced. The elementary sessions will cover single phase meters and theory. The advanced sessions will deal with poly-phase, demand meters, accuracy standards, theory and applications, etc.

Iowa Program Starts Instructor Classes

The Iowa Safety Program has started a series of job instructor classes which will result in each Co-op having one or more men capable of giving the new employee 'on-the-job training'. These classes will be important because they will help bridge the gap between knowing how to do a job and being able to teach someone else to do it. Often people with the most 'know how' are least able to pass on this knowledge to the other fellow.

Professor E. S. Baird, Teacher Trainer from Iowa State College, is conducting the sessions. Comment on the classes from Iowa linemen is highly complimentary. One of the unique features of this series was a Kiwanis program at Denison, arranged by Jim Morrow, Chairman of the Safety Advisory Committee and Manager of the South Crawford Rural Electric Cooperative. Jim took Professor Baird and some of his Co-op linemen to the Kiwanis Club and taught the club members how to 'lay up and tie in wire' and do other jobs which linemen are doing every day in all kinds of weather.

This program aroused a great deal of interest in the Kiwanis members and resulted in the longest meeting which the club has had for some time. The program was prolonged by popular demand of the Kiwanians.

Close Clearance Results In Electrical Burns

(SEE DIAGRAM ON PAGE THREE)

The Situation

A new generating plant substation had been built. The contractor was short of copper tubing for equipment leads. To hook up the equipment it was necessary to bring the oil circuit breaker (5) lead (a) diagonally up to connect with the instrument transformer (10). The dotted line in the sketch indicates the wide bend which this lead was designed to make.

The lead as installed did not properly clear the potential transformer (17) and disconnect. This installation was designed to mount with the bare primary between disconnect and potential transformer at a clearance of 7' 6" from the ground. To correct this, the potential transformer (17) was mounted lower on the frame at (A). The new location only provided 4 feet clearance between this primary lead and ground. In addition, there was only two feet clearance between the oil circuit breaker (5) and the potential transformer. A man attempting to pass through this two foot space would be in a very hazardous position. However, this installation was only temporary and this section would normally be worked with the disconnect (2) open and the generating units shut down.

The substation and generating plant were new. The employees, although experienced, had not operated the plant long enough to recognize all of the operating difficulties which might be encountered.

The Accident

An employee was trying to put an additional generator on the line to take care of an increase in load. The remote control oil circuit breaker (5) did not operate automatically as it should have done, so the machine was not feeding into the line.

The operator let the machine run and went to the substation and opened disconnect switch

(Continued on Page 2)

THE LINEMAN

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Published Monthly in the Interest of Safety for Employees of REA-Financed Systems

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Experience Can Be Costly

The Lineman is published to promote general acceptance and use of safe work practices by the men who operate and maintain the rural electric lines of America. Each month it brings its readers facts about the serious accidents which occur on rural lines.

The element of hazard in electrical line work is often determined by 'how' the job is done. How the job is done depends upon the general line knowledge and experience of the individual who plans the work. It is impossible for any one individual to encounter all of the actual situations which are possible in connection with his work.

In fact, many of these situations are encountered only once -- some are permanently disabling or fatal. The man with a hand burned off gains much experience but this experience is of little use in enabling him to save that hand once he has lost it.

Therefore, there is much to be gained by reviewing the details of how the other fellow got hurt, Knowing how the other fellow was seriously hurt or killed enables us to avoid like situations and provides more useful knowledge than the actual experience.

The truly experienced man has not only his own personal experience gained through actual work but also a wide knowledge of the other fellow's experience.

Careful study of accidents publicized in The Lineman has added to the knowledge and understanding of the men actually doing the work. This information is available due to the fine cooperation of the managers of the systems. Managers have a great many responsibilities, yet are never too busy to furnish sketches, reports and comment on serious accidents which happen on their system.

If you, the readers of The Lineman, have found the published accounts of accidents helpful, you may thank the manager. Sometimes you may think he doesn't have much time for thinking about you. You might be surprised to know that often he doesn't get the credit for his activities in your behalf. Seldom does he get any credit for his overall interest in the safety and welfare of men operating and maintaining the lines outside his own system.

The accident reported this month required three letters, furnishing a substation map and drawing in the changes as installed by the contractor.

TWENTY-FIVE STATES

Interest in Safety and Job Training developed in the States shortly before the war. By 1945, fifteen States had organized programs. The post-war demand for electrical service has resulted in an increasing need for training new men and guarding the safety of all of the men constructing, operating and maintaining the lines.

Twenty-five states now conduct Safety and Job Training programs with one or more full time men on the job. (See map.) These programs are directed by advisory committees made up of managers, linemen, and board members from each State with the cooperation of the various State Departments of Trade and Industrial Education.

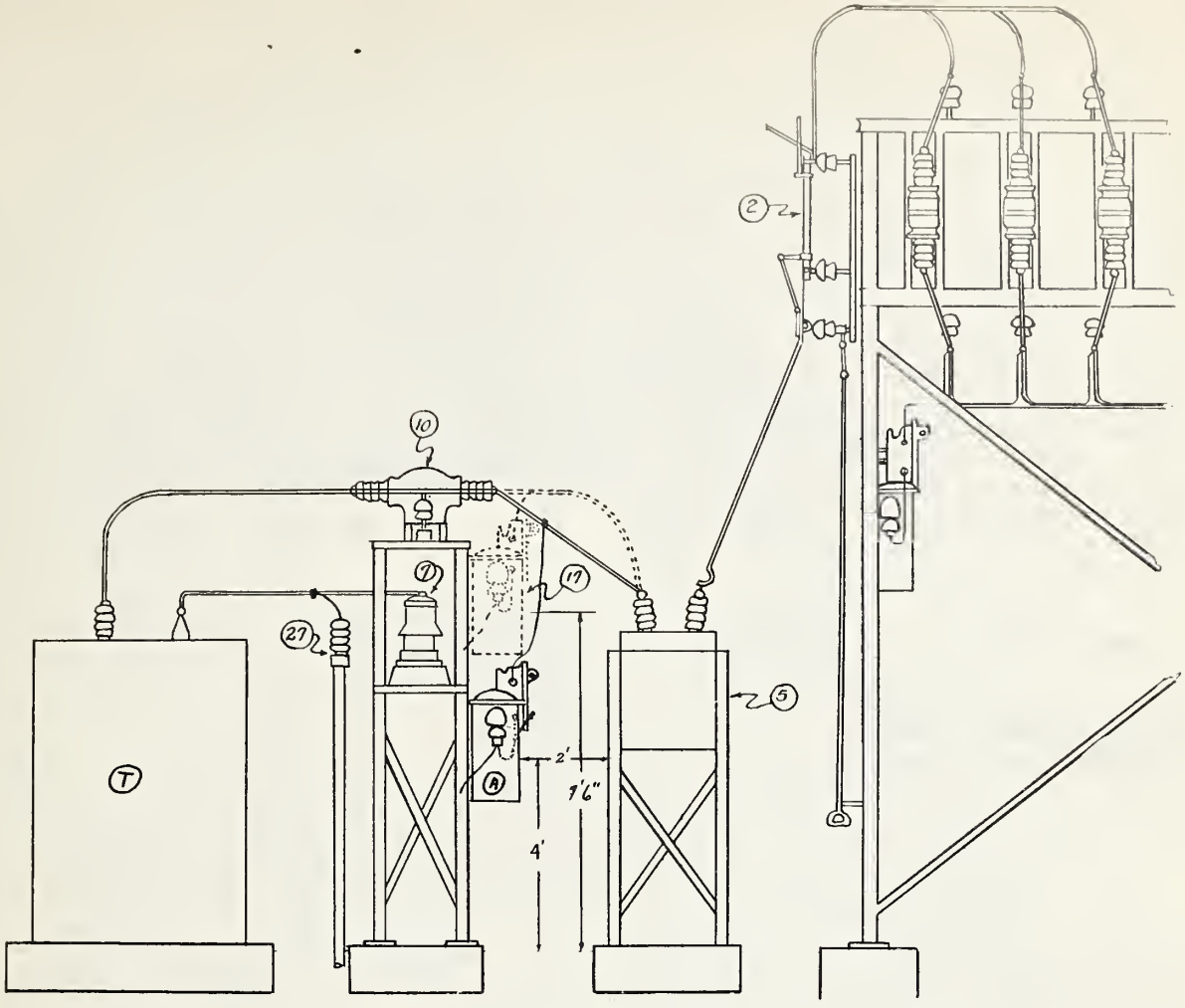
Several of the States have more than one man. Texas has four; the following States each employ two: Ohio, Georgia, Tennessee, Missouri, Kentucky, and Wisconsin. (The second man hired for Iowa resigned last month.) Several more States are looking for a second qualified man amd will increase their safety activity as soon as the additional man is secured.

Ralph A. C. Hill, Editor of The Lineman, has just returned from a visit to several Western States. He found a great deal of interest in Safety and Job Training among Co-op. managers. The following States are working out the details of obtaining a program with one or more full time men devoted to safety activities: Arizona, Oregon, Washington, Idaho, and North and South Dakota.

CLOSE CLEARANCE (From Page 1)

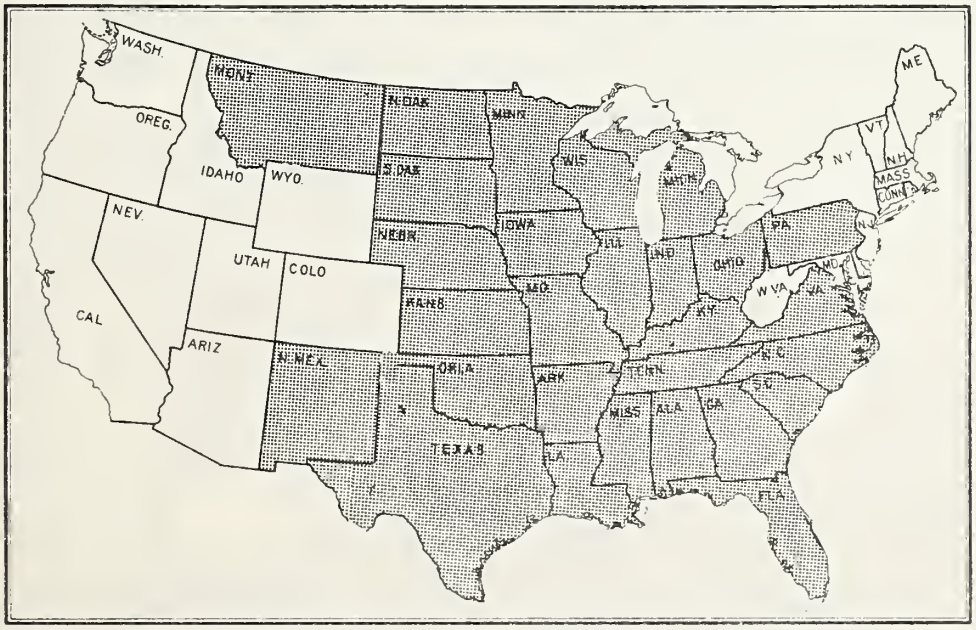
(2). He then started to open the panel door to the automatic control equipment of the oil circuit breaker. (Opening disconnect switch (2) merely prevents back feed and does not de-energize the section. To de-energize the section, it is necessary to shut down the machine.) In his haste to clear the trouble, the operator forgot that the machine in operation was feeding into transformer (T) and that everything was still hot up to the bottom of disconnect switch (2) which he had just opened.

While he was opening the panel on the oil circuit breaker, his head came in contact with the bare 7200-volt lead from the potential transformer to the cut-out (X). The electrical shock was not fatal. The man fell to the ground, unconscious, and stopped breathing. A fellow employee immediately began to give artificial respiration and the injured man was revived after ten minutes. He suffered severe electrical burns on the face, scalp, ears, neck, upper chest, fingers of both right and left hands, and the calf of the left leg. These burns ranged from first degree to third degree and several will require skin grafts.



In a unit type plant each generator feeds directly into a separate substation transformer. No station disconnects are provided inside the plant. The only way to de-energize equipment (T), (7), (10), (17), and the station side of (5) is to shut the machine down.

27 - Conduit from generator; 7 - Lightning arrester (on low side); T - Substation transformer; 10 - Instrument transformer; 17 - Potential transformer location; A - Temporary location of potential transformer (17); 5 - Oil circuit breaker; 2 - Disconnect switch.



Shaded area indicates states with one or more men devoting full time to Safety and Job Training.

TESTING FOR POLARITY

- Part 2 of a Series -

If transformer leads are not marked it is necessary to determine the markings of these leads before two transformers are connected in parallel. This operation is called 'checking for polarity'. One hundred twenty volts is all that is required to make the test.

First, connect a high voltage terminal to an adjacent low voltage terminal, attach a volt-meter to the other high and low voltage terminal and connect the primary to the 120 volt A. C. line. See Figure 1.

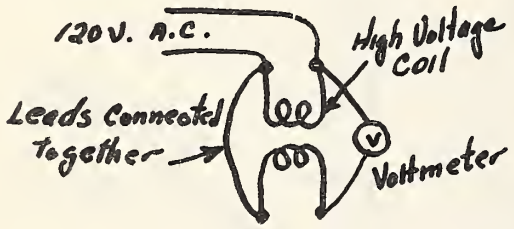


FIG 1

If the volt-meter reads higher than the voltage across the primary, it is apparent that the two coils are hooked up in series and the volt-meter reads the voltage in the primary plus the voltage in the secondary. In other words, the voltage is <u>additive.</u> (Refer to last month's article on polarity.)

The H 1 and X 1 leads on an additive transformer are diagonally opposite each other. To mark the terminals proceed as follows: Face the transformer on the high voltage side and mark the right hand high voltage lead H 1 and the left hand high voltage lead H 2. Diagonally across from lead H 1 mark the low voltage lead X 1. The other low voltage lead diagonally across from H 2 should be marked X 2. See Figure 2.

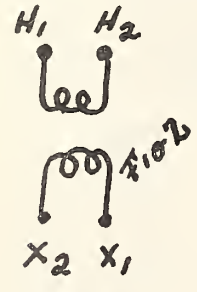


FIG. 2

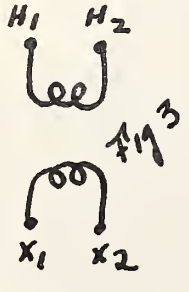


FIG. 3

If the volt-meter reads less than the voltage across the high voltage coil, it is apparent that the voltage in the secondary reduces or subtracts from the primary voltage. If this is the case, the volt-meter reading should be the primary voltage minus the secondary voltage. Such a transformer is said to have <u>subtractive</u> polarity.

In last month's article on polarity we found that a transformer with subtractive polarity has the H 1 and H 2 primary terminals directly opposite the X 1 and X 2 secondary terminals. Face the high voltage or primary terminals and mark the right hand terminal H 1 and the left hand terminal H 2. See Figure 3.

Checking polarity is that simple -- there is nothing complicated about it once the lineman understands a few simple facts and learns how to use them.

CAUTION!

It is recommended that the same precautions be observed in making a polarity test as in handling other energized equipment. The hook-up should be made cold and the transformer primary hooked across the 120-volt line last. Rubber gloves should be worn during the energization of the transformer and until the transformer has been disconnected. If the low voltage coil of a step-down transformer should be mistaken for the primary and hooked across the line, the voltage in the primary coil would be stepped up to a primary voltage determined by the winding ratio of the two coils. Such a mistake would be very hazardous. The transformer article next month will deal with transformer hook-ups.

See Engineering Memo 184, page 4, for further details.

Miles and Members

The following table shows the number of energized miles and members in states that operate Safety and Job Training programs as compared to the total number of miles and members in all states.

MOST RECENT FIGURES AVAILABLE

	ENERGIZED MILES OF LINE	% OF TOTAL	CONSUMER MEMBERS	% OF TOTAL
Total in the United States	577,064		1,964,362	
Total in 25 States with full-time Programs	521,123	90	1,689,011	86